

CLAIMS

What is claimed is:

1. A tire for mounting on a wheel rim, comprising:
- an integral homogeneous toroidal body having a pair of spaced-apart radially extending sidewalls and a cross member, each said sidewall having a first and a second end and an internal face and an external face, with the second end of each of the sidewalls integrally merging into the cross member;
- a set of rim-engaging surfaces at the first end of each of the sidewalls;
- at least one road-engaging surface on an external surface of the cross member;
- and
- an annular chamber defined by the internal faces of the sidewalls and an internal top wall on the cross member opposite the at least one road-engaging surface;
- wherein the set of rim-engaging surfaces includes a lobe-like portion at the first end of each of the sidewalls, the respective lobe-like projections being separable when the tire is not mounted on the rim, but being compressed into engagement when the tire is mounted in the rim, thereby closing the annular chamber.
2. The tire of claim 1 wherein the sidewalls are thick enough to be structurally stable.
3. The tire of claim 1 wherein the external face of each of the sidewalls is curved concavely.
4. The tire of claim 3 wherein the internal face of each of the sidewalls is curved concavely with respect to the annular chamber.
5. The tire of claim 1 wherein the thickness of the sidewall varies by more than 10%.
6. The tire of claim 1 wherein the external road-engaging surface of the cross

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member has a convex curvature across a width of the cross member.

7. The tire of claim 6 wherein the cross member has a constant thickness.

5 8. The tire of claim 1 wherein the tire body is homogeneously formed from an elastomeric material.

9. The tire of claim 8 wherein the elastomeric material is selected from a group consisting of: natural rubber, modified rubbers, urethanes and polyurethanes.

10 10. The tire of claim 8 wherein the tire body is compressionally conformed when mounted in the rim such that it is circumferentially anisotropic.

11. A tire for mounting on a wheel rim, comprising:
an integral homogeneous toroidal body having a pair of spaced-apart radially extending sidewalls and a cross member, each said sidewall having a first and a second end and an internal face and an external face, with the second end of each of the sidewalls integrally merging into the cross member;

a set of rim-engaging surfaces at the first end of each of the sidewalls;
at least one road-engaging surface on an external surface of the cross member;
and

an annular chamber defined by the internal faces of the sidewalls and an internal top wall on the cross member opposite the at least one road-engaging surface;

25 wherein the set of rim-engaging surfaces includes a lobe-like portion at the end of each of the sidewalls conjoining the respective sidewalls and closing the annular chamber.

30 12. The tire of claim 11 wherein the sidewalls are thick enough to be structurally stable.

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13. The tire of claim 11 wherein the external face of each of the sidewalls is curved concavely.

5 14. The tire of claim 11 wherein the internal face of each of the sidewalls is curved concavely with respect to the annular chamber.

15. The tire of claim 11 wherein the thickness of the sidewall varies by more than 10%.

10 16. The tire of claim 11 wherein the external road-engaging surface of the cross member has a convex curvature across a width of the cross member.

17. The tire of claim 16 wherein the cross member has a constant thickness.

18. The tire of claim 11 wherein the tire body is homogeneously formed from an elastomeric material.

19. The tire of claim 18 wherein the elastomeric material is selected from a group consisting of: natural rubber, modified rubbers, urethanes and polyurethanes.

20. A non-pneumatic tire for mounting on a wheel rim, comprising:
a toroidal body having a pair of sidewalls and a cross member,
a set of rim-engaging surfaces at the first end of each of the sidewalls;
at least one road-engaging surface on an external surface of the cross member;
and
an annular chamber defined by the internal faces of the sidewalls and the cross member;

25 wherein the rolling resistance of the tire when mounted in association with a wheel rim is designed to be minimized while maintaining acceptable operational characteristics for a predetermined duty cycle.

30 21. A method of manufacturing a tire for mounting on a wheel rim comprising the steps of:

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preparing a mold to produce a flat molded body conformable into a closed torus configuration,

using a homogenous elastomeric material in association with the mold to produce the molded body, the body having a pair of sidewalls and a cross member,

a set of rim-engaging surfaces at the first end of each of the sidewalls; and

at least one road-engaging surface on an external surface of the cross member;

conforming the flat body into a closed toroidal configuration and engaging the rim-engaging surfaces with a wheel rim.

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